

TMDL Name: Salisbury Pond, Worcester, MA (MA51142)

Lead State: Massachusetts

TMDL Status: Approved

Pollutant ID: Total Phosphorus

TMDL end point: 45.5ppb Total Phosphorus (TP)

List ID: MA51125

Impairment ID: Noxious aquatic plants; Turbidity

Cycle: 1998

TMDL type: point source

TMDL (final) submittal date: May 30, 2002

Actual establishment date: June, 2002

Notice to public date: October, 2001

EPA NEW ENGLAND'S TMDL REVIEW

TMDL: Salisbury Pond, Worcester, MA (MA51142)

Date: May 30, 2002

STATUS: Final

IMPAIRMENT/POLLUTANT: Noxious Aquatic Plants (Code 2200); Turbidity (Code 2500)
TMDL is developed for Total Phosphorus.

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BACKGROUND: The Massachusetts Department of Environmental Protection (MADEP) submitted to EPA New England the *Final Total Maximum Daily Load for Salisbury Pond, Worcester, MA, dated January 10, 2002*. The following is a summary of EPA's review which explains how the TMDL submission satisfies the statutory and regulatory requirements of TMDLs in accordance with Section 303(d) and 40 CFR Part 130. In addition to reviewing the TMDL document, EPA-New England also reviewed the 1987 *Diagnostic/Feasibility Study of Salisbury Pond* (D/F study), conducted by Camp Dresser and McKee (CDM), and recent data conducted in 1999 by MADEP, which provides the technical basis for the TMDL.

REVIEW ELEMENTS OF TMDLs

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations, and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.

1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The

*TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyll *a* and phosphorus loadings for excess algae.*

The Salisbury Pond TMDL adequately describes the waterbody, which is located in the headwaters of the Blackstone River Watershed in the center of the Mill Brook sub-watershed, in Worcester, MA. The pond is a 15 acre, municipally-owned pond located in Institute Park. The Pond was created by damming the Mill Brook in 1834 and used as a power source for a wire production mill. The Salisbury Pond TMDL of 1082 kg/yr total phosphorus is based on a (1987) Diagnostic/Feasibility (D/F) study conducted by Camp Dresser and McKee (CDM), 1987) and funded under the Massachusetts Clean Lakes Program According to the CDM (1987)D/F study, estimates indicate that the pond is filling in at a rate of 50,000 cubic feet per year between 1973 and 1987. The pond has a mean depth of only 0.96 m(3.1 feet) as of the 1987 CDM report. Recent depth data from a 1999 DEP survey show the pond is more shallow now with many areas nearly filled in with sediments. The watershed is a mixture of residential (59%) and urban (19%) land uses, as well as Forest (17%). Several stormwater drains feed into the lake however the major source of water is a twin inlet culvert at the north end of the lake which is the former Mill Brook, now diverted underground. This twin culvert drains both the Mill Brook watershed to the north (generally east of and including Interstate I-190) as well as water from the outlet of Indian Lake including areas west of I-190. (See TMDL p.11 for information on the twin culvert. For further information and map, contact DEP).

The document notes that the causes of impairment, as identified on the MA 1998 303(d) list, are noxious aquatic plants and turbidity (MA DEP, 1998). In addition, phosphorus loading from the lake's watershed causes the lake to experience nuisance algae blooms. One of the goals of the TMDL is to increase the transparency of the lake so that swimming is possible. Under MA DEP regulations, this requires transparency of 4feet.

Evidence of raw sewage in the Salisbury Pond is a continuing problem due to illicit connections to the storm water system. Recent citizen monitoring data indicated fecal coliform levels ranging from 100 to 16,000 colonies/100ml (Mass WaterWatch, 1999 unpublished data). Sedimentation is another source of impairment to the pond. These sediments are derived from a variety of sources including stormwater, erosion, unstable surfaces and other sources. Although, sediments are likely to contribute phosphorus loading to the pond, this TMDL is developed for phosphorus only. EPA New England expects MA DEP to list the pollutants, bacteria and sediments, on their 2002 303 (d) list and to schedule TMDL development for these pollutants.

If the target of 1082 kg/yr.of phosphorus turns out to be insufficient to address the impairments

caused by nutrient over enrichment of the pond, MADEP may need to 1) reduce the target TP concentration and/or 2) reassess their methods for controlling phosphorus inputs into the pond.

To estimate existing TP loadings, MADEP reviewed a mass-balance nutrient budget developed in the D/F study (CDM study, 1987). Natural background loadings were not distinguished from the total nonpoint source load. EPA New England believes that the effort to collect site-specific information for the purpose of separating natural background from the total nonpoint source load would add little value to the analysis. Important assumptions made in developing the TMDL are discussed (See TMDL, p. 16). One of the major assumptions is that control of TP loading will reduce aquatic weed growth and the potential for algae blooms.

EPA concludes that the use of the 1997 CDM D/F study provides a reasonable technical basis for the development of this TMDL.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

Water-quality standards (WQSs) have been violated for Nuisance aquatic plants and turbidity in Salisbury Pond. The TMDL describes the applicable WQSs, which include designated uses, narrative criteria, and an antidegradation policy. Salisbury Pond is listed as a Class B water. (See TMDL pp.14-15).

The phosphorus ecoregion map of Griffith (1994) indicates the lake is in an ecoregion with concentrations of 15-19 ppb, based on spring/fall concentrations, while the phosphorus ecoregion map of Rohm (1995) suggests that typical lakes in this ecoregion would have concentrations between 30 and 50 ppb, based on summer concentrations. Based on the above ecoregion analysis and the very fast flushing rate (413 times per year) of the pond, DEP has set the target average summer TP concentration at 45.5 ppb. According to DEP, because of the flow-through nature of the pond, the fast flushing rate of the pond (0.9 times per day) would tend to flush algae and duckweed out of the pond as fast as they grow and, thus, water transparency meeting the 4 foot swimming criteria may be met at a higher phosphorus level than in other, slower flushing lakes in the same ecoregion. EPA notes that ongoing monitoring will be needed to assess whether this TP is adequate for achieving the 4 ft. transparency goal.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

MA DEP proposes to set the loading capacity for Salisbury Pond at 1028 kg/yr of total phosphorus, a reduction of 3517 kg/yr from current levels (4646 kg/yr with MOS included); and to reduce average in-lake TP concentrations from 30-50 ppb to 45.5ppb (See TMDL pps.15-16). Note: DEP hopes to achieve a large portion of the loading reduction by reducing TP loading from the twin culvert inlet. Specifically, DEP estimates a reduction in loading from this source alone from 4480 kg/yr to 888 kg/yr.

The loading capacity was set to protect water quality and support uses during critical conditions which, for Salisbury Pond, occur during the summer season when environmental conditions (e.g., higher temperatures, increased light intensity, etc.) are most favorable for growth of phytoplankton and macrophytes.

The Salisbury Pond submittal includes documentation supporting the technical approach (i.e. based on the CDM D/F study) and key assumptions used in the analysis. The TMDL document discusses some of the limitations that are inherent in analyses involving nonpoint pollution

sources and impairments caused by nutrient enrichment in lakes and ponds.

Principal strengths of this TMDL document are that it considers the flow dynamics of the pond and uses existing data to estimate current TP loading to the pond. Weaknesses in the approach are the lack of information about specific pollution sources, and the uncertainties concerning the relationship between pollutant loadings and aquatic macrophyte growth. (See TMDL 15-17).

EPA New England concludes that MADEP has used a reasonable approach to establish the relationship between pollutant loading and water quality, and concurs that it is appropriate to express the TMDL as an annual loading based on the reasons provided by MADEP.

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

DEP sets the Load Allocation for existing and future nonpoint sources to 0 kg/yr TP (See TMDL, p. 16).

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be designated a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be designated to the group of facilities. But it is

necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

The TMDL sets the total of all Wasteload Allocations for existing and future point sources to 1028 kg/yr TP. Wasteloads are allocated for stormwater flow, which include discharges from the twin culvert inlet, drain #4 Stormflow, as well as other drains and runoff into the Salisbury pond. Stormwater in this watershed is regulated under the EPA NPDES Phase I Stormwater program.

The largest reduction is targeted for the twin culverts, most of which is expected to be accomplished by removal of the sewage contamination and by implementation of stormwater BMPs at the inlets and at Mass Highways sites, with is expected to reduce overall loading of the twin culverts to 888 kg/yr. (See TMDL p.16).

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

The Salisbury Pond TMDL includes an explicit MOS of 5% (54 kg/yr), which has been set aside as unallocated (See TMDL, p. 16). DEP has set the load allocation at 1028 kg/yr TP. This plus an unallocated load of 54 kg/yr TP (i.e. the MOS) equals the pond's total loading capacity of 1082 kg/yr.TP (i.e. the TMDL).

EPA concludes that MA DEP has set a sufficient MOS for this TMDL.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)).

The TMDL was developed to be protective of the most environmentally sensitive period (summer season), when the frequency and occurrence of nuisance algal blooms and macrophyte

growth are the greatest. To assure protectiveness during the critical summer season, the total phosphorus load is the average summer concentrations. Therefore, the TMDL will also be protective of water quality during all other seasons.

Although the flushing rate in Salisbury Pond is much faster (less than two days), than in most ponds, MADEP adequately justifies setting an annual rather than a daily load. Salisbury Pond's overall nutrient state is largely expressed by excessive aquatic plant growth and accumulation of nutrients in sediments, both of which are a function of long-term average rather than short-term pollutant loadings.

EPA-New England concludes that seasonal variations have been adequately accounted for in the TMDL.

8. Monitoring Plan for TMDLs Developed Under the Phased Approach

EPA's 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), recommends a monitoring plan when a TMDL is developed under the phased approach. The guidance recommends that a TMDL developed under the phased approach also should provide assurances that nonpoint source controls will achieve expected load reductions. The phased approach is appropriate when a TMDL involves both point and nonpoint sources and the point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. EPA's guidance provides that a TMDL developed under the phased approach should include a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of water quality standards.

The TMDL describes the extent of MADEP's proposed monitoring and monitoring schedule. Monitoring will be done according to the 5-year MA watershed cycle, with the Blackstone basin scheduled for monitoring in 2003. Monitoring will include nutrient analysis, temperature and oxygen profiles and aquatic vegetation maps of distribution and density, and Sechi Disk Transparency. Also, MA DEP will work with and encourage volunteer efforts to monitor the lake and identify pollution sources in the watershed.

EPA New England concludes that the proposed monitoring by MA DEP together with the on-going annual volunteer monitoring will be sufficient to evaluate the adequacy of the TMDL. Collection of annual in-lake TP data by the Mill Brook Task Force that are of acceptable quality to MADEP will greatly facilitate MADEP's ability to evaluate the effectiveness of controls and the adequacy of the TMDL.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or

primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

The Salisbury Pond TMDL implementation plan is described in the TMDL on pages 17-21. Some of the plan's main components are: continued efforts to separate stormwater from sewers; MA Highways BMPs (ongoing)-including prioritizing cleaning and street sweeping; catch basin cleaning; and repair of stormwater structures; erosion control; public education; and in-lake management—actual methods will be determined by the City as plans are developed and approved by the Conservation Commission.

If the target of 1082 kg/yr. of phosphorus turns out to be insufficient to meet wq standards, MADEP may need to consider other control measures to reduce phosphorus input by the twin culverts, including rerouting the twin culvert or treating it in some fashion to reduce pollutant loadings from culverts.

The plan outlines a process for collecting additional information to identify phosphorus sources, provide watershed residents with non point source pollution and lake water quality education, and give guidance to apply for grant and loan funding to control sources once they are identified. Tasks and responsible parties are identified in Table 2 (See TMDL, p. 20).

10. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997 Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

Reasonable assurances that the Salisbury Pond TMDL will be implemented are provided through current regulations, availability of financial incentives and the existence of various local, state,

and federal pollution-control programs. Table 2 lists the posed implementation tasks and responsible groups. Many of the implementation tasks related to phosphorus reduction are the responsibility of either MADEP or the watershed team which is led by the MA Executive Office of Environmental Affairs (EOEA). EPA New England has the opportunity through the Performance Partnership Agreement (PPA) process to work with MADEP to provide reasonable assurances for implementing the Salisbury Pond TMDL. The responsible groups for tasks related primarily to outreach programs and developing funding proposals include the EOEA Watershed Team and the Mill Brook Task Force.

It was also noted that the City has committed to and begun implementation of an aggressive program designed to identify and correct sources of sewage to the storm drain system, as part of its EPA NPDES Stormwater permit (MASO01002) for its stormwater discharges. It should also be noted that the City of Worcester has begun implementing recommended control measures listed in the TMDL by building sediment traps on the twin culverts and two other inlets under a DEP Section 319 grant.

EPA-New England believes there is reasonable assurance that these practices will continue in the future.

11. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2)).

Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

The public participation process for the Salisbury Pond TMDL is described on pages 22-23 of the final document. MADEP held a preliminary public meeting on November 9, 1999. The final public meeting was held on October 18, 2001 to discuss the findings of the TMDL. MADEP has provided, in the final submittal, a clear record of comments received and MADEP's responses to those comments. (See TMDL pps. 22-23). Appendix III of the submittal provides a list of the Public meeting attendees..

EPA-New England concludes that MADEP has done an adequate job involving the public during the development of the TMDL, and has provided adequate opportunities for the public to comment on the TMDL. Additionally, MADEP has provided, in the final submittal, a clear record of comments received and MADEP's responses to those comments. EPA-New England concludes, based on a review of pages 22-23, that MADEP has adequately responded to all public comments.

12. Submittal Letter

A submittal letter should be included with the TMDL analytical document, and should specify whether the TMDL is being submitted for a technical review or is a final submittal. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody, the pollutant(s) of concern, and the priority ranking of the waterbody.

